RADIATION PHYSICS NOTE #15

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This note reports on the response of the scarecrow electronics to "pulsed fields". Measurement methods and techniques were similar to those described for similar measurements on chipmunks in Radiation Physics Notes 8 and 10.

As a reminder the "field" parameters which were varied were dose rate, spill length, cycle time and time constant associated with the ion chamber. The response of the scarecrow electronics was monitored by recording meter fluctuations, the output of the current digitizer and the "pulses as counted by mux". The field parameters investigated are indicated in the table below. As before Tc is the cycle time, Ts is the spill length and T is the time constant associated with the ion chamber. In addition we recorded the D. C. response as a function of dose rate.

	Ts(sec)			
Tc(sec)	0.5	1	2	10
5	τ=1sec			
12	τ=20sec	τ=1sec		
20		τ=1sec	τ=1sec	
30		τ=1sec τ=20sec		
60				τ=1sec

Figures 1 and 2 show the scarecrow response for typical accelerator operating conditions and the 1 sec time constant which all the scarecrows presently have. The solid dots (•) indicate the average meter position, the vertical bars indicate the swing of the meter, the open squares (□) indicate the output of the digitizer (called detector dose rate) and the open triangles (△) indicate what the mux system would report (called mux dose rate).

As you can see the meter fluctuation tend to be large and the average high. This means that when they are used as an interlock in a system which trips on the meter peak they are very conservative. The digitizer output shows no surprises i.e., it is reasonably linear. The "mux data" shows the expected "satuation" effect due to the way the system is strobed.

Figure 3 shows that for D. C. fields the mux information flattens out and will not exceed 6.3 rem/hr which is expected from the 70 Hz strobe and 25 μrem/pulse. The previous figures indicate we do not even closely approach the 6.3 rem/hr limit under present conditions.

Figure 4 is the same as figure 2 except the time constant on the ion chamber has been increased to 20 seconds. The longer integration time yields much improved meter response (both swing and average position) and makes the mux data reliable up to the maximum of 6.3 rem/hr.

The time constant on the chambers is being increased to 20 seconds. However, as mentioned above, even under the

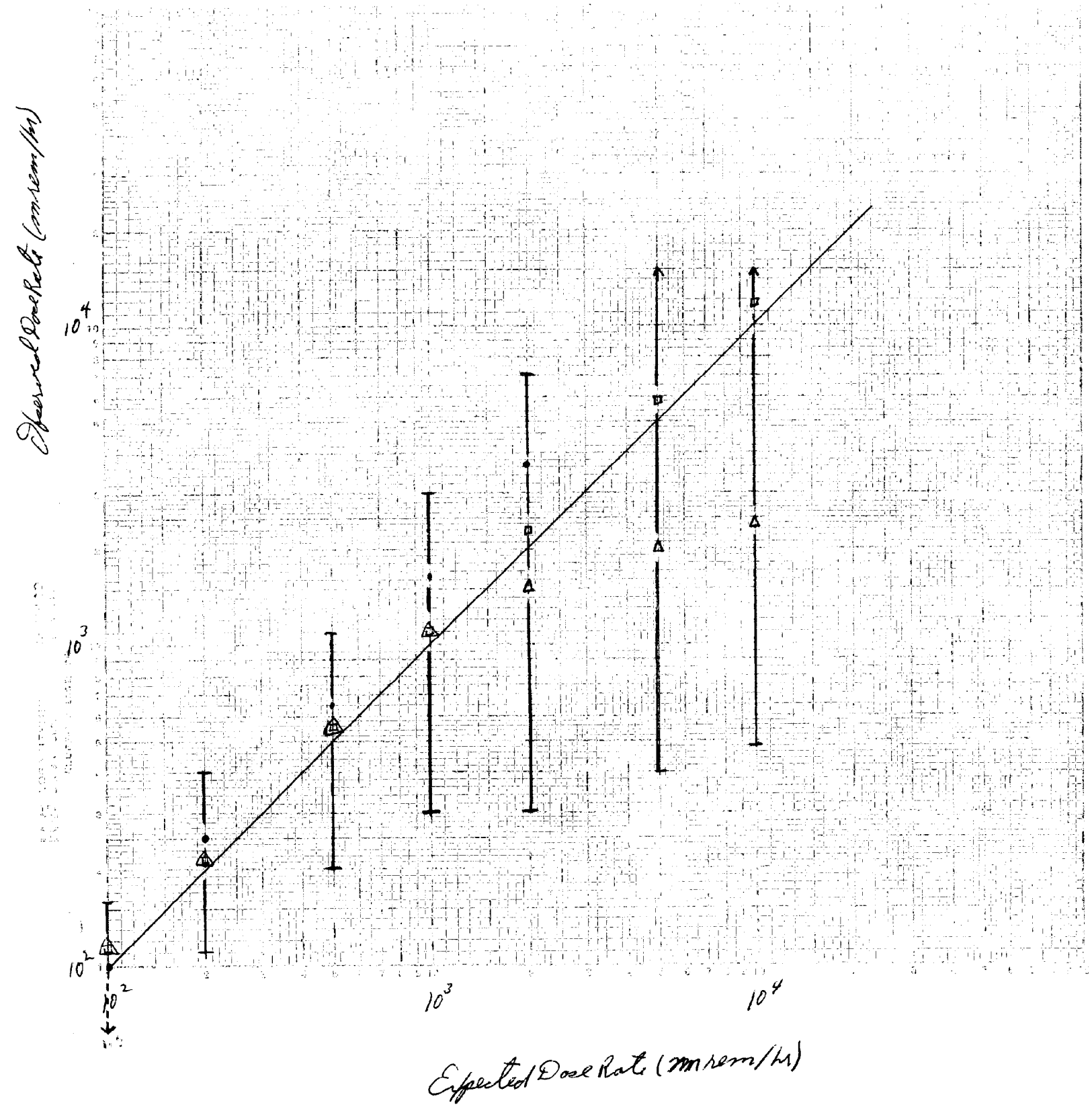
best conditions the mux data should not be trusted for dose rates above 6 rem/hr. Under present conditions (1 sec time constant) it should not be trusted above about 1 rem/hr. In a similar manner mux information from chipmunks (2.5 μrem/pulse) can never exceed 630 mrem/hr.

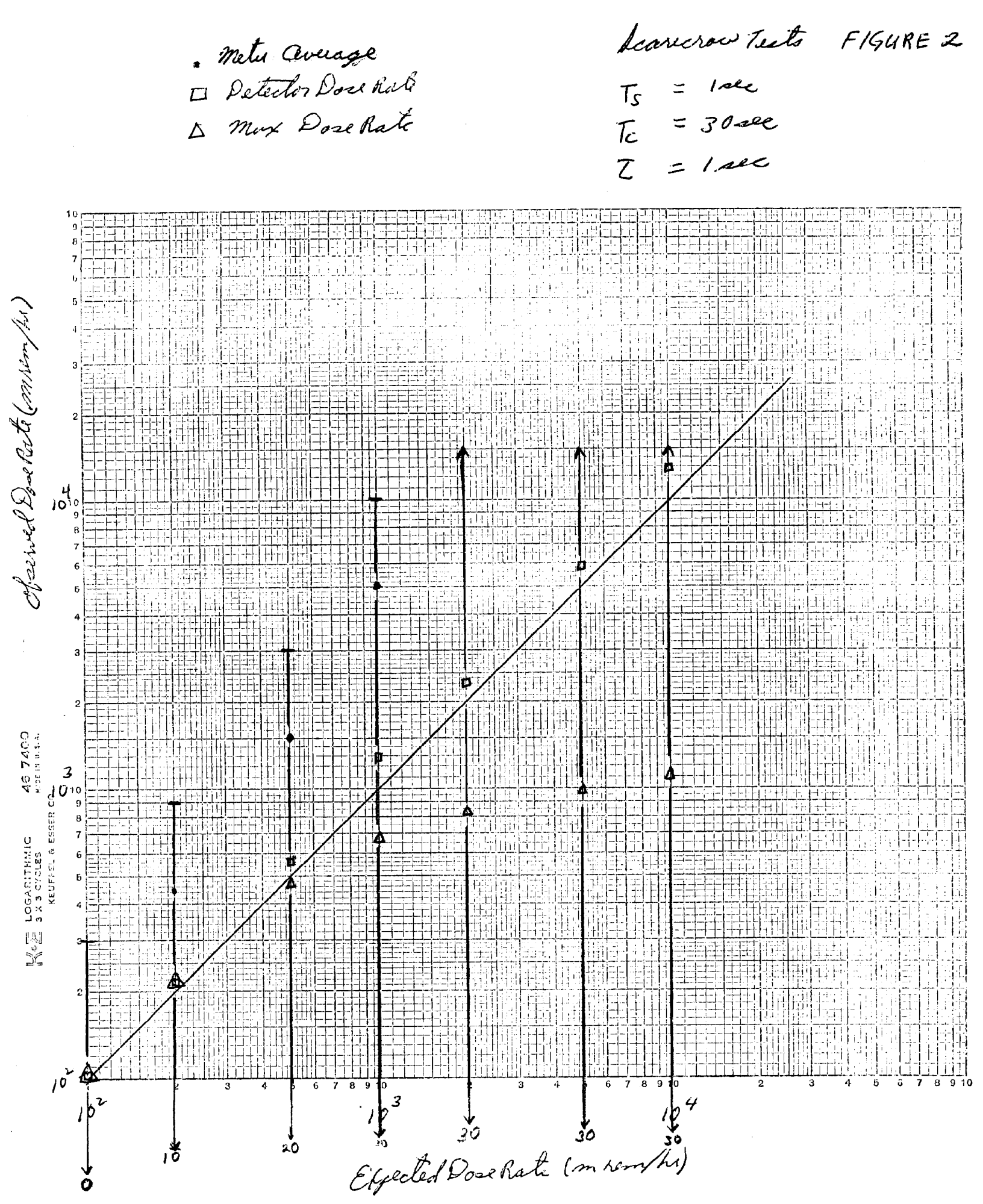
Both the scarecrows and chipmunks have the feature whereby each pulse on mux represents ten times the normal dose i.e., 250 μrem and 25 μrem respectively. If this is done then the mux information for scarecrows and chipmunks can be trusted up to 60 rem/hr and 6 rem/hr respectively.

Scarecrow Tests FIGURE 1

• Meter Average
□ Detector Dose Rate
△ mux Dose Rate

T_S = 1 sec
T_C = 12 sec
τ = 1 sec




• Meter Average
□ Detector Dose Rate
△ Max Dose Rate
Scarecrow Tests FIGURE 2
T_S = 1 sec
T_C = 30 sec
τ = 1 sec
Observed Dose Rate (mrem/hr)
Expected Dose Rate (mrem/hr)
LOGARITHMIC
3 X 3 CYCLES
KEUFFEL & ESSER CO.
46 7400

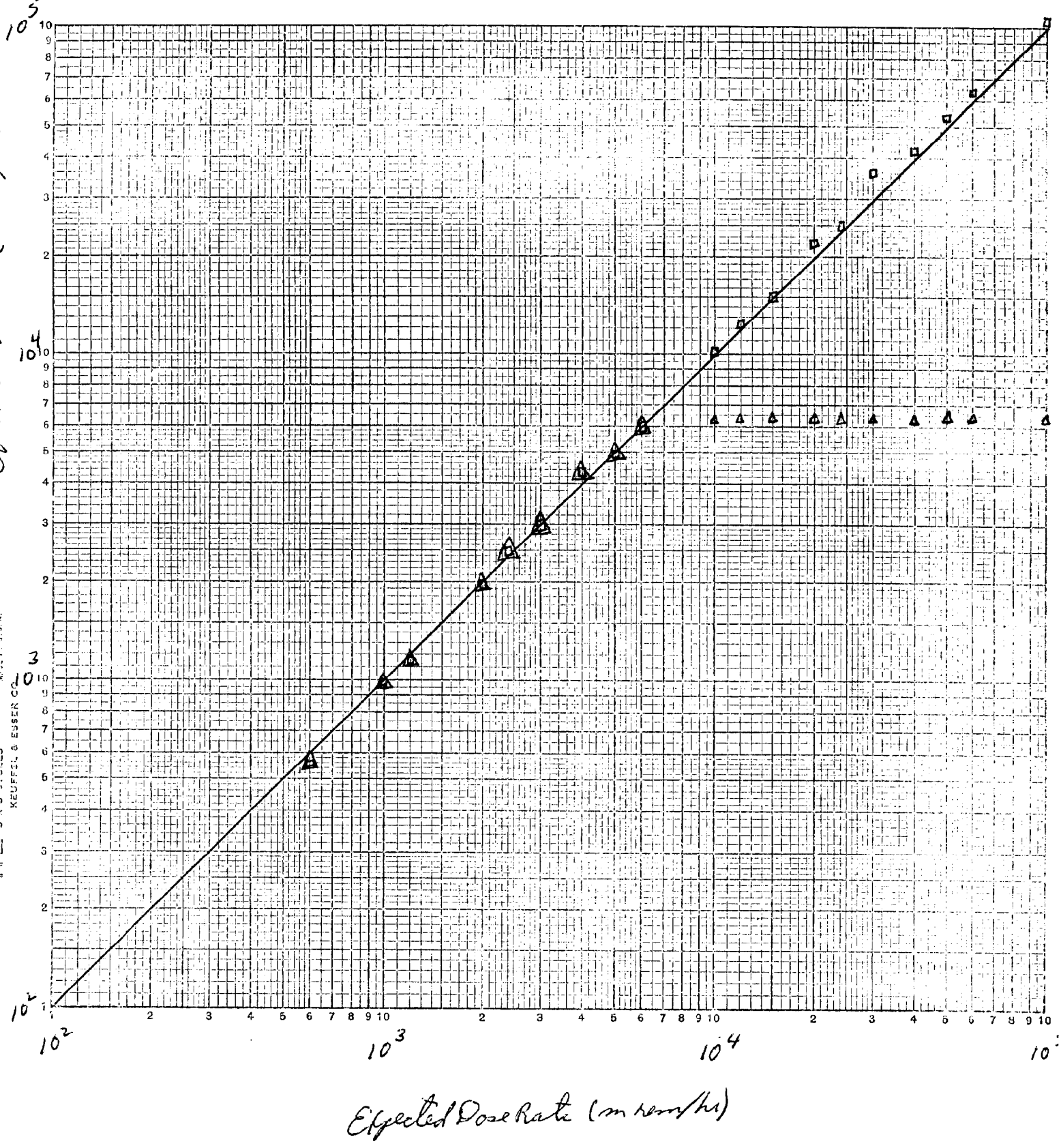
Scarecrow Tests FIGURE.

□ Detector Dose Rate

△ Mux Dose Rate

T_S = } D.C.

T_C = }



• Meter Average
□ Detector Dose Rate
△ Max Dose Rate

Scarecrow Tests FIGURE 4

T_s = 1 sec

T_c = 30 sec

τ = 20 sec